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THE COMMITTEE ON EDUCATIONAL RESEARCH

*Faculty of Education
University of Alberta*

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Editorial

One of the more satisfying and potentially productive experiences of recent years has been the increasing degree of liaison and consultation that has developed between the University of Alberta and the Department of Education. This consultation has not infrequently been extended to include other organizations having a vital interest in education.

The progress report contained in this issue of the *Alberta Journal of Educational Research* covering a research project under way which is termed the Matriculation Study points this up in three ways.

In the first place the Advisory Committee on Educational Research which has been instrumental in establishing the *Journal* comprises in its membership the University, the Department, the Alberta School Trustees' Association, the Alberta Teachers' Association, and the Alberta Federation of Home and School Associations. In the second place the same bodies are represented on the continuing committee which regularly considers the effect of matriculation requirements upon the high school and of high school programs upon university entrance. The committee is called The Joint Committee to Co-ordinate University and High School Curricula. It makes recommendations to the University and to the Department in these respects. And in the third place the study being reported upon involves close co-operation between officers of the University and of the Department both in the planning of the research and in carrying forward its experimental and statistical work.

A reading of the progress report covering the Matriculation Study will surely convince one that matters of great concern, and of complexity, are under review and that a sincere and determined effort is being made to find out facts and then, based upon these facts, to arrive at procedures which will improve the validity of selection of university students. I wish to commend especially Dr. D. E. Smith, of the Department of Psychology, and Mr. A. B. Evenson, of the Department of Education, for their energetic pursuit of this study.

W. H. SWIFT,
Deputy Minister,
Department of Education.

A STUDY OF MATRICULATION IN ALBERTA

A. B. EVENSON AND D. E. SMITH

I. *Introduction*

More and more of your young people are remaining for a longer and longer time in school. Already, in Alberta, the proportion of the 15-to-19-year age group remaining in school is close to one-half; and in certain other areas of this continent it is considerably greater than one-half. At the same time, the opportunities for satisfactory employment, for persons of this age group, except via the secondary school, are rapidly diminishing. Thus there has been relentless and increasing pressure on the secondary schools to make continuing adjustments in methodology and curriculum to meet the needs of an ever larger and more variable school population. These pressures have been greatly intensified by the rapid increase in birth rate immediately after the Second World War. The high school on this continent has been compelled to accept a dual responsibility: the preparation of a select group of students for further academic work at University, and the preparation of a much larger group of students for life in the world at large.

II. *Objectives of Secondary Education*

The normal educational expectation for young people fifty years ago was a Grade VIII Diploma, whereas today it is a High School Diploma. In the past, those who continued in high school were the select few who were definitely preparing for University courses which led to the professions. Today the high school has these objectives, as set forth in the *Curriculum Guide for Alberta*

Secondary Schools:

1. Personal development;
2. Growth in family living;
3. Growth toward competence in citizenship;
4. Occupational preparation.

In addition, the high school has the task of preparing students for University.

The University receives a proportion of the high school graduates, and must from among these give a sufficient number of individuals training of sufficient quality to serve the needs of society for professionally trained persons. The University is expected to guarantee a high standard of training, despite the pressure resulting from a shortage of nurses, engineers, teachers, dentists, doctors and the like.

III. *Objectives of University Education*

The term "higher education" is often applied to university study; it implies not only a continuation of growth begun in the elementary and high schools, but also a kind of effort in which only the more capable students will be successful.

There is no authorized statement of the objectives of university education, but they might be stated as follows:

1. To display to men and women, more intensively than the secondary school can, the intellectual and cultural heritage developed in the arts and humanities, and in the natural and social sciences;
2. Thereby to prepare individuals of high ability for a fuller use of their talents in the life of the community, in business and in government;
3. To give professional training to individuals who require knowledge and skill of a high order in the practice of their vocations;
4. To develop scholars in the learned professions who will enrich the intellectual and cultural heritage for the future.

Traditionally the university takes little or no responsibility for the personal development of students. It recognizes, however, the importance of continuing this growth; and appreciates the part played by extracurricular activities in the life of the student. At this age, the student profits greatly by experience in organizing and supervising these activities, as well as participating in them.

IV. *Facts Relating to the Problem*

1. The drop-out rate is high. If we trace the Grade I enrolment of 1944 through the years, we find that although 18,495 started Grade I, nine years later 12,288 were in Grade IX, in the following year 9,637 were enrolled in Grade X, and in June of 1955, 3,600 received a High School Diploma, including 1,420 who secured matriculation (University entrance) standing. The high rate of mortality in the high school grades is not determined primarily by examinations, but is nevertheless related to intellectual capacity; only about 280 out of every 1,000 students enrolled in Grade IX obtain a High School Diploma; and only about 54 of these have an I.Q. (Henmon-Nelson) of 105 or less.
2. High School enrolments are increasing. In 1912 only 2.08 percent of the total school enrolment was in high school (Grades X, XI, XII); in 1954 this proportion was 12.00 percent.. The interests and abilities of the larger number of high

school students are more varied than were the interests and abilities of the smaller enrolments of former years.

3. University education is not suited to all children. Terman has estimated that 12.7 percent of children are capable of "profiting from instruction in a first-class University". In 1955, only about 1,000 Alberta students entered degree programs in a University, whereas the proportion indicated by Terman would have meant about 2,500 students. At the current rate of drop-out, only about two-thirds of these may be expected to graduate with a degree. Clearly there are able students in our schools who do not have the opportunity to profit as they might from further instruction, whether in University or elsewhere; and at the same time some students are going on to University who are not well able to undertake University work.
4. The demand for high school and university graduates is increasing. There is a shortage in many of the learned professions. At the same time the demand for unskilled labor is decreasing.
5. Only about 55 percent of our high school population is taught in high schools which have three or more teachers from Grades X, XI, XII. Thus nearly half of our secondary school population is receiving instruction under academic conditions that are far from ideal.

These conflicting pressures on high schools and universities have led to difficulties in articulating the programs of these institutions. Alberta has had its share of these difficulties, and discussions by interested groups led ultimately to a request for a study. At the meeting of the High School Curriculum Committee held April 22 and 23, 1954, a motion was passed recommending "that the Articulation Committee set up an appropriate committee to study the validity of the present system of selecting students for university education, and to explore the merits of alternative systems."

The above motion was considered by the Joint Committee to Co-ordinate University and High School Curricula at its meeting on June 18, 1954, at which time it was agreed that a special committee should be set up to study the validity of the present system of selecting students for university education and to explore the merits of alternate systems. At the next meeting of this committee on December 8, 1954, a special subcommittee was set up with the following personnel:

Professor D. E. Smith	} Co-chairmen
A. B. Evenson	

Dr. S. C. T. Clarke

Dr. G. L. Mowat (replaced in 1956 by Dr. T. C. Byrne)

M. J. V. Downey

H. R. Hawes

It was agreed that this subcommittee should be known as The Matriculation Study Subcommittee with the following terms of reference:

1. Test the validity of Grade IX examinations and other tests as a measure of success in (a) Senior High School and (b) University;
2. Test the validity of Grade XII examinations as a measure of success in (a) Senior High School and (b) University;
3. Test the validity of success in non-academic subjects as a measure of success in University;
4. Study the experience of other universities in testing other types of matriculation regulations.

The Matriculation Study Subcommittee commenced its work early in 1955. Before arriving at some plan of action a survey of relevant literature and local research reports was made. The Subcommittee found many suggestions from research done elsewhere, but there were many gaps in information available about Alberta. Because of differences between various high school programs, as well as between universities, it was felt that the suggestions based on other studies must be confirmed by an exploratory study of success at the University of Alberta carried out with students from Alberta High Schools.

The Subcommittee posed a number of questions that seemed pertinent to the problem:

1. Is there sufficient flexibility in high school curricula to accommodate the wide differences in ability, interest and maturity that prevail among young people of similar age?
2. Why do the majority of students entering high school fail to receive a high school diploma?
3. Are high school standards changing?
4. How best can the schools identify those who will profit from further education?
5. Are Grade XII marks a sufficiently accurate predictor of success in university?
6. What criteria other than (or along with) Grade XII examinations might be used for the selection of university applicants?

7. Are there student who do not meet formal matriculation requirements yet might actually do commendable university work?
8. Are there students at university who should not be there?
9. Why do many students drop out of universities before graduation?
10. Are university standards changing?

On 19th April, 1955, the Matriculation Subcommittee made its first progress report to the Joint Committee. After a review of some of its findings to date, the Subcommittee sought, and obtained, approval in principle for a study of the 1951 Freshman Class at the University of Alberta.

The 1951 Freshman Survey

The Freshman class of 1951 had been selected because students registered in three-year degree programs, if successful, had already graduated, and those in four-year degree programs should graduate in 1955. It would thus be possible to investigate success of students at university, not only in the first year, but also at the end of normal university programs. Further, certain tests had been administered to that group which might prove useful, but which earlier freshmen had not been given.

The following data were tabulated on each student entering the University of Alberta in September 1951, and completing a full year in April, 1952:

- (a) Name, age and sex;
- (b) The general test score and the final grade for Grade IX;
- (c) The name of any intelligence test taken during high school, and the I.Q. obtained;
- (d) The distribution of grade points obtained in all courses in Grades X and XI;
- (e) The actual grades obtained on certain representatives non-academic elective high school subjects (Bookkeeping, Shorthand, a technical subject, Art, Drama, Psychology, Sociology, Biology, Geology);
- (f) The number of years spent in high school, and the year in which the high school program was completed;
- (g) The average mark on Grade XII subjects;
- (h) The score on the American Council of Education's Psychological Examination for Freshmen*;

*This test of intelligence or scholastic aptitude is administered to first year students at the University of Alberta (after registration) for the use of Student Advisory Services. The scores were obtained by the kind permission of Dr. A. J. Cook, Director of Student Advisory Services.

- (i) The faculty or school in which the student was registered, and the average mark obtained, separately for each university session from 1951 to 1957;
- (j) The degree or diploma obtained by every graduate, and the date it was obtained.

After these data were recorded, every item was coded and all the information transferred to I.B.M. punched cards. This material provides voluminously for the investigations required by the first three of the Subcommittee's terms of reference. To this end, the following analyses were given priority by the Subcommittee:

- (1) Correlation of Grade IX examination results and the general test raw scores separately with first year university average marks and final year university average marks;
- (2) Correlation of Grade XII average marks with first year university average marks, both for the total group and separately for some representative faculties;
- (3) Correlation of A.C.E. total scores with first year university average marks, both for the total group and separately for some representative faculties;
- (4) Similar correlations between Grade XII averages and average marks in second year at university, and in subsequent years, year by year, ending with the average mark in the year of first graduation;
- (5) Similar correlations between A.C.E. total scores and average marks for second (and subsequent) years at university;
- (6) Mean of Grade XII marks and of first year university marks, separately by various schools and faculties, of students who drop out at the end of the first year at university;
- (7) The number of students, separately by faculties, who drop out of university year by year;
- (8) Correlation of grade points in Grades X and XI, in both academic and non-academic electives, with average marks at university;
- (9) Analysis by multiple correlation of combinations of two or more of the variables indicated above with average mark at university.

In its first progress report to the Joint Committee, the Matriculation Subcommittee indicated that it would be desirable to administer a special battery of scholastic aptitude and subject achievement tests. In its review of the experiences of other universities, it was impressed by:

1. The research study completed in Ontario by W. D. Fleming on "Factors Affecting the Predictive Accuracy of Ontario Grade XIII Results".
2. The projected study which is to be carried on in the province of Ontario during the next three years. This latter study is fully described in a pamphlet entitled "Prospectus for a Study of the Supply of Canadian University Talent", (Revision of Bulletin 17).

In its second progress report, therefore, the Subcommittee raised these questions:

1. Is the best potential university material being selected on present criteria?
2. What proportion of students who do not go to university have comparable aptitude and achievement with those who do?
3. Are high school standards in Alberta changing?
4. Would not careful follow-up studies on the students tested provide much meaningful and useful information?
5. Would one or two additional criteria (that is in addition to Grade XII results) improve our present selective methods?

The Subcommittee went on to obtain approval in principle for a study of Grade XII students in the spring of 1956, using a battery of standard ability and achievement tests developed by Educational Testing Service and the College Entrance Examination Board.

The 1956 Grade XII Survey

The College Entrance Examination Board (CEEB) has operated in the United States for approximately a half-century to give a common basis for admission to universities of students trained in the varying educational systems of 48 states. The Board now acts in an advisory and supervisory capacity, and the work of preparing, printing, issuing, administering and scoring the tests is carried out by Educational Testing Service (ETS)*.

CEEB examinations contain sixteen tests of ability and achievement, of which the following were selected for this survey:

- (1) The Scholastic Aptitude Test, which yields both a verbal score (SAT-V) and a mathematical score (SAT-M);
- (2) Seven achievement tests (selected for their relation to Grade XII subjects commonly presented for matriculation by Alberta students):

*The Subcommittee owes a deep debt of gratitude to the College Entrance Examination Board and Educational Testing Service for supply of materials, marking of papers, and preliminary analysis of results, all at very low cost; and particularly to Dr. D. Black, of the staff of ETS, Los Angeles, for advice and assistance far beyond the call of duty.

College Board Achievement Tests

English Composition
Biology
Chemistry
Physics
Intermediate Mathematics
Advanced Mathematics
French

Alberta Grade XII Courses

English 30
Biology 32
Chemistry 30
Physics 30
Mathematics 30
Mathematics 31
French 30

A province-wide sample of high-school seniors was used. Every attempt was made to avoid bias from geographical location, student ability, and interest reflected in his own selection of subjects in the achievement tests. The students were therefore randomly selected to take certain pairs of achievement tests, in addition to the Scholastic Aptitude Test, which every student was to take.

Information regarding the fall registration in Grade XII subjects was already recorded on I.B.M. punched cards. These cards were then sampled to obtain groups of students who were prepared to write CEEB achievement tests by participation in corresponding Grade XII subjects.

In an attempt to avoid bias through subject combinations selected by students or their teachers, students were arbitrarily assigned to 21 groups, each group representing one of all possible combinations of two achievement tests from a possible battery of seven tests. The sampling aimed at a final total sample of 1,200 cases per subject elective, or 200 cases for each of the subject pairs. It was estimated that 200-250 cases of the initial sample per subject would be lost for a variety of reasons. Therefore, a random sampling of 1,435 cases per subject was drawn, with one exception: there were only 1,183 students in the Province taking Mathematics 31 which made them eligible to write the College Board's Advanced Mathematics test. A sample of 1,110 cases for this particular subject was drawn, which, in effect, was not a random sample, but rather represents the full population for this subject.

The CEEB tests were written on May 18, 1956.

The final number of students actually writing each test and test pair is listed in the following table:

Size of Achievement Test Sample Including Sample
Size for Twenty-one Subject Pairs

	Eng.	Bio.	Chem.	Phy.	I. Math.	Ad. Math.	Fr.
English	1,273						
Biology	223	1,254					
Chemistry	199	209	1,267				
Physics	206	195	227	1,223			
I. Math.	228	224	219	206	1,236		
Ad. Math.	149	128	146	150	158	880	
French	206	215	218	212	180	143	1,203

A few students wrote the Achievement Tests without taking the SAT. An additional group of students was randomly selected from the total population to take only the SAT, bringing the total sample of SAT scores to 5,818.

It was decided that the whole study would be strengthened if all or practically all of the Alberta Grade XII students would write the Educational Testing Service's School and College Ability Test (SCAT), level 1. To facilitate the scheduling of the total testing program it was decided that this particular test would be administered during the period of the Easter examinations. The total number of students who wrote SCAT, level 1, was 6,450.

At the time the CEEB tests were administered, every student was required to complete a Student Questionnaire, containing 25 questions relating to his personal background, and plans for further study and future employment.* At the same time, principals of high schools were asked to rate all students participating on 9 factors involving initiative, industry, extra-curricular activities, and interest in further education, with a 10th rating of overall prospects for success in university.

Results of all tests, replies to all questions and ratings of all factors have been recorded on I.B.M. punched cards and are available for analysis. Grade point scores for Grade X and XI subjects, and marks on Grade XII Departmental Examinations, have also been recorded on the cards, and marks obtained at the University of Alberta (by those students registered there) will be added as they become available.

The Subcommittee hopes to learn from this material:

- (a) How valid is our present method of selection which uses a single criterion, namely results on Grade XII examination?
- (b) Would the additional factor of scholastic aptitude improve our present selective method?
- (c) Would standardized achievement tests, such as those of the College Board, predict university success any better than do our Grade XII examinations?
- (d) What proportion of high school students who do not enter university have scholastic aptitude and achievement comparable to those who do?
- (e) How do students of small and large high schools compare in scholastic ability and achievement?

The Educational Testing Service provided means, standard deviations, and percentile equivalents (based on the Alberta group)

*This questionnaire was adapted from one used in the Province of Ontario's "Study of the Supply of Canadian University Talent".

for scores on all tests used. Data were also supplied showing the scores made by students in the United States on the same tests. Since the test is taken in the United States only by high school students who are applying for a university entrance, these scores are not comparable to the whole group of Alberta Grade XII students, who have many programs and plans for the future. The Subcommittee therefore obtained the names of all students who applied for admission to the University of Alberta in 1956, who would form a group comparable with the United States norm group. Names of students enrolled in the University of Alberta for the 1956-57 session were also obtained.

The Subcommittee has the following studies under way:

- (a) Numerous correlations such as the following are being calculated:
 - 1. Grade XII examinations against CEEB Achievement Test scores.
 - 2. Aptitude scores against achievement, both in Grade XII and on the College Board Achievement Tests.
- (b) Comparison of the attainment of Alberta students on the CEEB tests with national norms, particularly from the United States.
- (c) Numerous comparisons between students who entered the university last fall with those who were not accepted and with these who did not apply.

These studies are planned for the future:

- (a) Some time during the summer and fall of 1957 a good part of the available data will be studied in relation to university results at the end of the first year.
- (b) In 1958 this study will be carried one step farther after the results of the second year university are known.

Application of Results

Analysis of the data obtained in the surveys described above, and inferences from these data, might eventually affect school curriculum, placement and examinations; university entrance requirements; and university curriculum, placement and examinations.

The results obtained will be reported in subsequent articles in this journal.

THE DEVELOPMENT OF DESIGN IN ALBERTA'S EDUCATION

THE PRE-PROVINCIAL PERIOD 1875-1905

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The separate school is a type of local administrative organization unique to Canadian education. This article attempts to appraise the influence of the separate school question on design and structure in the Alberta provincial system of schools. Since the Alberta design is a product of the Territorial period the study is historical with particular reference to the development of provincial autonomy and the formation of cabinet government.

The Political Growth of the North West Territories—1875-1905

During the westward expansion of Canada the term North West Territories has been applied to different geographical areas in successive historical periods. The area with which this study is concerned is that presently occupied by the provinces of Alberta and Saskatchewan. The entire territory west of the province of Manitoba to the foothills of the Rocky Mountains was for a thirty year period a single political unit with a government centered eventually in the city of Regina.

The distinctive political career of the North West Territories commenced with the passage by the Dominion Parliament of the North West Territories Act of 1875.¹ The Act created a type of colonial government having a lieutenant-governor selected by the federal government and an appointed council to assist him in the administration of the western territories.² The council was granted the power to "make, ordain, and establish" ordinances within the class of subjects enumerated, these dealing with such problems as local taxation, property and civil rights, police and "generally all matters of merely local or private nature."³

Within the body of the Act were provisions assuring the future self-government of the Territories. Any area of one thousand people might be granted the privilege of electing a representative to the council. When the number of elected members reached twenty-one the Council was to be reconstituted as a legislative assembly.⁴

¹C. Cecil Lingard, *Territorial Government in Canada* (Toronto: University of Toronto Press, 1956), p. 4.

²*Statutes of Canada*, 38 Victoria, c. 48, sec. 3.

³*Ibid.*, sec. 7.

⁴*Ibid.*, sec. 13.

The rapid growth of population in the Territories was reflected by the increasing number of elected members in the Council. Within ten years those elected outnumbered the appointed, and by 1888 the Territories Act was revised to established a representative assembly.⁵ Provision was made, as well, for the selection by the Lieutenant-Governor of an advisory council from the members of the Assembly to proffer advice on matters of finance.⁶ Through this section of the revised statute were drafted governing structures admitting the possibility of responsible as well as representative government.

A limited measure of parliamentary government only was established through the appointment of an advisory council. The age long struggle, so familiar to British history, for the control of the purse and the full control of the executive by the legislature was again re-enacted in Canada's youngest legislature during the next three years.⁷ In the end the Canadian parliament granted the territorial assembly full control over the expenditures of territorial funds, most of which came by way of grant from the senior government.⁸ The relationships of the Advisory Council to the Assembly were clarified by an ordinance in 1892 in which the Council was renamed the Executive Committee of the Territories.⁹ Finally responsible government "defacto" established by this territorial ordinance became "de jure" through the federal statute of 1897 which recognized that "the expression Lieutenant-Governor in Council means the Lieutent-Governor of the Territories by and with the advice and consent of the Executive Council of the Territories . . . ,"¹⁰ the members of which were to be selected from the Legislative Assembly.

Cabinet government was facilitated further through this act by permitting members of the Assembly to receive an annual salary from public funds.¹¹ The North West Assembly immediately passed a Public Service Ordinance providing for the establishment of departments of the Attorney-General, Treasury, Public Works, Agriculture, and Public Instruction, the head of each being defined as a "member of the Executive Council for the time being presiding over a department."¹² Following these constitutional changes a cabinet

⁵Statutes of Canada, 51 Victoria, c. 19. "An Act Respecting the North West Territories 1888."

⁶Ibid., sec. 13.

⁷Lingard, *op. cit.*, p. 6.

⁸Statutes of Canada, 54-55 Victoria, c. 22. "An Act to Amend the Acts Respecting the North West Territories, 1891."

⁹Ordinances, North West Territories. No. 1 of 1891-92.

¹⁰Statutes of Canada, 60-61 Victoria, c. 28. "An Act to Further Amend the Acts Respecting the North West Territories, 1897."

¹¹Ibid., sec. 9.

¹²Ordinances, North West Territories, No. 13 of 1897. "An Ordinance Respecting the Public Service of the Territories."

known as the Executive Council was formed under the leadership of Sir Frederick Haultain, the first premier of the North West Territories.

The contributions of the North West Assembly to its legal successors, the government of Saskatchewan and Alberta, are major and historically significant. At the turn of the century the foundation of a school system had been laid, a scheme of municipal organization devised, and a system of judicature established.¹³ The basic social institution of the twin provinces are an inheritance of the territorial period and a product of its political thinking and leadership.

Despite the large measure of self-government achieved by the Assembly, the territorial government suffered certain limitations through the lack of provincial status. The government could not, for instance, charter railways, nor borrow money on public credit. In addition, the natural resources of the Territories had been kept in the hands of the federal government making the Assembly dependent on Ottawa for its major revenues.¹⁴ The following quotation from Lingard summarizes the political stature of the Territories, underscoring a need for the increased autonomy which was possible only through full membership within the Canadian confederation.

The closing years of the century found the Territories with a constitution approaching the provincial basis, with enlarged jurisdiction, increased responsibilities and new duties, but with inadequate revenues to deal with these. The Dominion government had been more generous in extending legislative jurisdiction than in enlarging appropriations.¹⁵

The debate over provincial status for the Territories occupied the attention of Canada for the first five years of this century. A major facet of the national argument, significant to this study, was that of deciding the type of school system to be established or maintained in the proposed province or provinces. The backgrounds of the separate school issue and the compromise with which it was eventually resolved are outlined here for their relevancy to an analysis of design in the Alberta school system.

The Separate School Question and Provincial Autonomy

The origins of separatism in public education, while unquestionably an outgrowth of religious and racial friction in Upper and Lower Canada, date back in the legal sense for Alberta to the North West Territories Act of 1875. The federal parliament, for reasons deriving from the political and social context of central Canada,¹⁶ granted

¹³Shortt and Doughty, *Canada and Its Provinces*, Vol. 19, p. 222.

¹⁴C. C. Lingard, *op. cit.*, p. 7-8.

¹⁵*Ibid.*, p. 20.

¹⁶George M. Weir, *The Separate School Question in Canada* (Toronto: Ryerson Press, 1934), p. 27.

control of education to the North West Council but limited its autonomy with the following proviso:

A majority of ratepayers of any district or portion of the North West Territories . . . may establish such schools therein as they may think fit, and make the necessary assessment and collection of taxes therefor; and further, that the minority of ratepayers therein, whether Protestant or Roman Catholic, may establish Separate Schools therein and that, in such latter case the ratepayers establishing such Protestant or Roman Catholic Separate Schools shall be liable only to assessments of such rates as they may impose upon themselves in respect thereof.¹⁷

A dissentient system of schools for the North West Territories similar to that existing in Quebec was implied by this statute. Recognition of this in the "School Ordinance" of 1884 involved two important principles of denominational schools: the exemption of the taxpayer of a minority group from the support of schools which the majority "may think fit" to establish if he were a separate school supporter; and the establishment of a central board of education with a membership drawn equally from the Catholic and Protestant citizenry. This board was to "resolve itself into two sections" Protestant and Catholic, each to have the management and control of schools under its jurisdiction as well as the grading and licensing of teachers, the choice of textbooks, and the appointment of inspectors for these schools.¹⁸ The effect of the ordinance was to set up two distinct school systems in the territorial area.

After the establishment of representative government in 1888, the administration of territorial schools became a subject of bitter controversy in the North West Assembly. The issue lay between the supporters of a national or common system of schools and those advocating the retention of separatism along sectarian lines in public education.¹⁹ The debate centred on a proposed reconstitution of the Board of Education, the object of which was to create radical changes in the central administrative agency.

The ordinance of 1892 modified the existing separatism considerably, moving in the direction of a national or state system of schools. The Board of Education was abolished to be replaced by a Council of Public Instruction consisting of the Executive Committee of the North West Assembly and four appointed persons, two of whom were to be Catholic and two Protestant. The function of the appointed members was, however, to be purely advisory, they having no vote in the Council's proceedings.²⁰ Minority schools were maintained, and the principle of free choice in tax payments was granted the minority ratepayer who might wish to support a separate

¹⁷Statutes of Canada, 38 Victoria, c. 49, Sec. XI.

¹⁸Ordinances, North West Territories, No. 5 of 1884, sec. 5.

¹⁹Shortt and Doughty, *op. cit.*, Vol. XX, p. 453.

²⁰Ordinances, North West Territories, No. 2 of 1892, sec. 5.

school of his own denomination, either Catholic or Protestant. Separate Schools were to be governed by the same regulations as those applying to public schools. Uniformity was established with respect to courses of study, textbooks, teachers' qualifications, departmental examinations, and inspections.²¹ Inspectors of schools were to be appointed by the Lieutenant-Governor-in-Council and were enjoined to administer the regulations of the Council in all publicly supported schools in the Territories.²² The discretionary powers of the local school agencies or boards were related to religious observances and instruction. They could rule that school be opened with the Lord's Prayer, and they could provide some form of religious education during the last half hour of the school day.²³

The final step in the modification of Section XI of the North West Territories Act was taken through the Ordinance of 1901.²⁴ This enactment placed education directly under cabinet control with a member of the Executive Council acting as head of the newly created Department of Education envisioned in the Public Service Ordinance of 1897. With this final change in administrative structures, the North West Assembly had evolved a national or state system of public education with provision for separatism locally but with a centralized provincial control of the interna of all schools.

The separate school question once more became a matter of dispute during the nation-wide controversy over the establishment of the provinces of Alberta and Saskatchewan in 1905. Sir. Wilfrid Laurier, Prime Minister of Canada, proposed the inclusion in the autonomy acts for the two provinces of a proviso that the provincial control of separate schools would be "subject to the provisions of the said section 93 (British North America Act) and in continuance of the principle heretofore sanctioned under the North West Territories Act."²⁵ This proposal precipitated a bitter national debate that centred around the issue of provincial sovereignty in the field of education.

The Laurier proposal, while intended ostensibly to assure the system of separate schools fully established by the ordinance of 1901, could well provide the legal basis for challenging all territorial legislation modifying the denominational system established by the original North West Territories Act.²⁶ The Liberal government maintained that Section 93 of the British North America Act should apply to any province entering confederation with a system of

²¹*Ibid.*, sec. 5c.

²²*Ibid.*, sec's. 11 and 21.

²³*Ibid.*, sec. 50.

²⁴Ordinances, North West Territories, No. 29 of 1901.

²⁵Weir, *op. cit.*, p. 67.

²⁶*Ibid.*, p. 67-68.

separate schools²⁷ and, further, that the British North America Act 1871 gave the Dominion Parliament the legal right to prescribe constitutions for the provinces.²⁸ The proponents of provincial rights countered that section 93 should apply exclusively to Ontario and Quebec, it being a compact freely assumed by those provinces in 1867, and that other provinces should have the right to decide their own systems of education. For the Dominion Government to protect by constitutional restriction the existence of a separate system of schools that it had itself created through federal legislation was, by opposition standards, an unwarranted infringement of provincial sovereignty.²⁹ The issue was not the propriety of separatism as such, but the refusal of the Dominion cabinet to accept fully the conceptual design of federal decentralization and provincial autonomy in the national system of education.

Political pressure on the Liberal government forced it to retreat from its original position and to resolve the dispute by a generally acceptable compromise. Section 17 of the Alberta Act quoted below became the constitutional basis for the exercise of authority over schools by the provincial legislature:

Section 93 of the British North America Act 1867 shall apply to the said Province with the substitution for paragraph (1) of the said section 93, of the following paragraph:

(1) Nothing in any law shall prejudicially affect any right or privilege with respect to separate schools which any class of persons have at the date of the passing of this Act, under the terms of Chapter 29 and 30 of the Ordinances of the North West Territories, passed in the year 1901, or with respect to religious instruction in any public or separate school as provided for in the said Ordinances.³⁰

The long range effect of this statute has been to freeze local separatism dependent on a minority right to establish church-related schools, in the mold created by the Ordinance of 1901. The validity of Section 17 has gone unchallenged in the courts though conceivable the legislation might have been declared *ultra-vires* of the Dominion Parliament.³¹ The constitutional issue as to whether the provisions of Section 93 apply exclusively to Ontario and Quebec, the only provinces having their constitutions incorporated in the British North America Act, or should be applicable to all provinces entering confederation after 1867, has had no judicial decision. Methods of local school organization, nevertheless, that were originally an expedient answer to problems created by racial and religious strife in Upper and Lower Canada have been imposed on

²⁷Lingard, *op. cit.*, p. 165.

²⁸Statutes of Canada, 34 and 35 Victoria, c. 28, sec. 2. "British North America Act 1871."

²⁹Lingard, *op. cit.*, pp. 165-197.

³⁰Statutes of Canada, 4 and 5 Edward III, C. III, sec. 17. "The Alberta Act, 1905."

³¹Wier, *op. cit.*, p. 70.

two of the western provinces through federal action rather than through provincial planning or agreement. Local separatism has been an eastern export that only part of western Canada successfully avoided.

Despite section 17 of the Alberta Act, the conceptual design of education in Alberta is not dissimilar to that of other provinces. The statute restricts but does not negate the principle of provincially autonomy in education. While it is true that the limitation was imposed by a senior government rather than agreed to by the people of the province, nonetheless it had its source in common with a major share of Canadian constitutional law. Furthermore, the provincial legislature is free to alter the character of public education as long as it recognizes that once established "a separate school district and board thereof shall possess all rights, powers, privileges and be subject to the same liabilities and methods of government as is herein provided in respect of public school districts."³² The ordinance protects separate school districts from discriminatory treatment but, similarly to public school boards, separate school boards are the agents locally of the province, subject to provincial regulation and having no constitutional privileges other than those related specifically to religious instruction.

The Separate School Question and Cabinet Control

The movement to modify the denominational school organization established in 1884 explains in part the assumption of control by the Executive Council of the North West Assembly. With the growth of parliamentary procedures after 1888, territorial administrative structures were altered, transferring executive authority from the Lieutenant-Governor to a responsible cabinet. Concomitant with this development came the centralization of authority over schools in an executive body possessing administrative functions of a general nature. The elimination of the special purpose board of education, while seemingly inevitable under parliamentary government, was accelerated by the issue of separatism. That Ontario, too, had followed this route, although perhaps for different reasons, gave added impetus to the transfer of power.³³

No responsible cabinet existed during the period 1884 to 1891 when territorial schools were administered by a special board as a unique function of government. The Executive Committee created by the Ordinance of 1893 was the first administrative body enjoying the full confidence of the Assembly through its acceptance of the

³²Ordinances, North West Territories, c. 29, sec. 45, 1901.

³³T. C. Byrne, "Design and Structure in Canadian Education," *The Alberta Journal of Educational Research*, Vol. III, No. 1, (March, 1957) pp. 28-43.

principle of cabinet responsibility. Administration by the Council of Public Instruction, the successor to the Board of Education, was an intermediate step in the achievement of cabinet control. The new administrative board was, in effect, the cabinet, but the establishment of education as a government department was not yet possible. While vestiges of denominationalism remained in the stipulated religious qualifications for the four appointed members, a major step had been taken towards a state or common school system by coordinating the instructional leadership of all schools under an appointed official, the Superintendent of Education.

The Public Service Ordinance of 1897 made possible eventually the complete integration of school control into the general administrative structures of the Territories with a cabinet minister as head of the newly created department. All that remained of the original Board of Education was an advisory council with denominational representation having no real function beyond that of proffering advice. Within seventeen years authority over territorial schools had been transferred from a board constituted along denominational lines to the Executive Council of an Assembly representative of the province as a whole. Church-related schools were a local possibility, but centrally the cabinet exercised, through its department, full control of the school system in a program of state education which accepted little or no responsibility for religious instruction.

The maintenance of a national or common school system through the exercise of centralized control over textbook selection, curriculum, teacher certification and inspection strengthened the centralizing trends in the administration of instruction. The North West Assembly had extended, through the cabinet, its control over the interna for the purpose of securing a common system of schools. At the beginning of the period of assembly government separatism existed at both central and local levels. By 1901 it had been relegated to specific types of local districts. To widen the scope of local authority by decentralizing control over interna might have the effect of increasing separatism at the expense of a common program of instruction, a complicating factor in estimating the future role of provincial leadership.

Conclusions

1. The pattern of local school organization developed to meet religious problems in Upper and Lower Canada was transplanted to the North West Territories by legislation of the Dominion parliament.
2. The replacement of the denominational system of education established in the North West Territories by a national system

of schools was effected by centralizing school administration in the executive council or cabinet exercising control over textbook selection, programs of study and school inspection. The central authority assumed a dominant role in the control of internal affairs in order to limit separatism to local administrative rather than instructional differences.

3. Parliamentary government has resulted eventually in the elimination of special purpose provincial boards in Canadian school administration, centralizing school control in a government department under cabinet leadership. This has enhanced both the power and the prestige of the central agency.

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READING AND ARITHMETIC REASONING A PARTIAL CORRELATION AND MULTIPLE REGRESSION ANALYSIS*

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Introduction

The relationship of the basic skills of reading and arithmetic to the content areas is becoming a fairly well-tilled plot in the field of educational research. However while the value of such research is unquestionable, there is a disappointingly small number of studies on the relationships which may exist *between* these skills. In a study of achievement at the Grade XI level, Aukerman¹ suggested that general reading ability might be the most differentiating factor between good and poor students in mathematics. Sutherland² in a study of arithmetic problem-solving, concluded that three factors appear in equal saturation, viz. 'g', 'verbal', and 'numbers'. In a study of arithmetic achievement at the Grade VII level, Treacy³ suggested that there was a marked relationship between proficiency in reading skills and arithmetic achievement. Johnston⁴ found that the vocabulary test of the Chicago Primary Mental Abilities yielded the highest correlations of various abilities with the regular arithmetic problem-solving tests. Traxler and Townsend,⁵ in a study of the relationship of differences between verbal and numerical aptitude, suggest that differences between verbal and numerical scores have value for the prediction of differences between reading achievement and mathematical achievement of individual pupils. Hamilton⁶ found evidence to suggest that increased general reading will improve reading comprehension of mathematical material. Hansen⁷ found that superior achievers in arithmetic problem solving

*The writer wishes to express to Professor Eric Hodgson his indebtedness for valuable advice.

¹Robert E. John Aukerman, "Differences in The Reading Status of Good and Poor Eleventh Grade Students," *Journal of Educational Research* XLVI, 1948, pp. 498-515.

²J. Sutherland, "An investigation into Some Aspects of Problem-Solving in Arithmetic," *British Journal of Educational Psychology* II, 1941, pp. 215-222.

³J. P. Treacy, "The Relationship of Reading Skills to the Ability to Solve Arithmetic Problems," *Journal of Educational Research* 38, 1944, pp. 86-96

⁴J. T. Johnston, "On the Nature of Problem-Solving in Arithmetic," *Journal of Educational Research* 43, 1949, pp. 110-115.

⁵Arthur E. Traxler and Agatha Townsend, "Relationship of Difference between Verbal and Numerical Aptitude to Differences in Achievement in English and Mathematics," *Educational Records Bulletin* 61, (July 1953), pp. 61-65.

⁶R. C. S. Hamilton, "Construction and Administration of an Instrument for Measuring Reading Comprehension of Mathematical Material," *British Journal of Educational Psychology* XXIII (November 1953), pp. 203-205.

⁷Carl W. Hansen, *Journal of Educational Research* Vol. 38, No. 2, 1944, pp. 111-118.

scored significantly higher in tests of general reading ability than inferior arithmetic achievers. Lazerte⁸ in his comprehensive survey of the studies of arithmetic problem-solving abilities has this to say of reading ability and problem-solving:

Pupils are handicapped in problem-solving if they are deficient in reading ability . . . The real problem meant to be conveyed often remains hidden until the printed sentences are properly interpreted. Even when the problem is clearly in mind, the relationship of part to part must be appreciated before a correct solution can be planned.

On the basis of this evidence, it appears reasonable to assume that some relationship does exist between reading and arithmetic achievement. However, the majority of these studies have been carried out at the elementary level of Grade VI and up. There is a great need for more intensive research in the primary grades.

The Problem

The present study represents an attempt to examine the possible relationships which may exist between reading achievement and arithmetic achievement at the Grade II level. In particular, the study will be concerned with an analysis of two areas which might not only be representative of their respective skills but which might, on an a priori basis at least, prove a fruitful source of exploration for the purposes of this study, namely reading comprehension (together with word knowledge) and arithmetic reasoning. Stated formally, the problem is this: to what extent does variance in reading comprehension and word knowledge contribute to variance in arithmetic reasoning?

Tests

The Stanford Achievement Test is, according to its authors, "a series of comprehensive achievement tests designed to measure the important knowledges, skills and understandings commonly accepted as desirable outcomes of the major branches of the elementary curriculum."⁹ The Primary Battery includes five tests, Paragraph Meaning, Word Meaning, Spelling, Arithmetic Reasoning, and Arithmetic Computation. Of these, all but Spelling appear to lend themselves to the needs of this investigation, and a word or two on each might be in order.

The Paragraph Meaning Test consists of a number of paragraphs in progressive order of difficulty, from each of which one or more words has been omitted. Comprehension of the paragraph is measured by the pupil's success in selecting the proper word for each omission from four possible choices. A split-half reliability coefficient of .956 is claimed for this test at the Grade II level.

⁸M. E. Lazerte, *The Development of Problem-Solving Ability in Arithmetic*, p. 123.

⁹Stanford Achievement Test, Primary Battery, Manual. World Book Company, 1953.

The Word Meaning Test claims to measure not only word meaning of the definition type but “higher-level comprehension of the concepts represented by words, and fullness and understanding of terms.”¹⁰ A reliability coefficient of .912 is claimed.

The Arithmetic Reasoning Test, according to its authors, “involves a combination of the language of quantitative comparison, arithmetic information, ability to read, the thinking aspects of problem-solving, some ability in computation, and other factors merged into one score.”¹¹ This test yields a reliability coefficient of .788.

Finally, the Arithmetic Computation Test attempts to measure primarily addition and subtraction. The split-half reliability of this test is given as .878.

The first two tests, Paragraph Meaning and Word Meaning can be combined to yield an Average Reading Score.

Procedure

The Stanford Achievement Test (Primary Battery, Form J) was administered to 159 grade II pupils from fourteen graded rural schools in Alberta in the last month of that grade. In addition the Otis Alpha Quick-Scoring Mental Abilities Test was administered since, for obvious reasons, analysis of achievement must take intelligence into account. No significant differences with respect to means and variances of the fourteen groups were found, and homogeneity of the total pooled sample was assumed. Statistical analysis of the data involved obtaining product-moment *r*'s, partial *r*'s, and a multiple *r* expressed in terms of Beta coefficients obtained by the Doolittle solution.

Results

Table I shows the means, standard deviations and score ranges for the five variables. The achievement scores are grade scores.

TABLE I
MEANS, S.D.'S AND SCORE RANGES

	Arithmetic Reasoning	Arithmetic Computation	Average Reading	Otis I.Q.	Chron. Age in Months
Means	31.43	28.64	32.23	102.02	98.15
S.D.'s	6.20	3.43	7.07	12.86	6.67
Range	13-49	15.38	18-50	70-137	84-130

It is of interest to note that both the Arithmetic Reasoning and Average Reading grade scores suggest a wider range of individual differences with respect to achievement in these areas than do the scores in Arithmetic computation. While it is difficult to do little

¹⁰Ibid.

¹¹Ibid.

more than speculate on the interpretation of these findings, three possible questions may be asked. First, is the discriminatory power of the Arithmetic Computation Test weaker than that of the Arithmetic Reasoning and Average Reading Tests for this sample? Secondly, could the relatively smaller variance of the Arithmetic Computation scores be attributed to pedagogical factors? Finally, does the emergence of arithmetic reasoning ability precede that of arithmetic computational ability as measured by this test, and for this sample?

Table II indicates the development of a fourth order partial correlation of Arithmetic Reasoning and Average Reading, with I.Q., Arithmetic Computation and chronological age partialled out.

TABLE II

Variable X_1 = Arithmetic Reasoning			
Variable X_2 = Average Reading			
Variable X_3 = Arithmetic Computation			
Variable X_4 = Otis I.Q.			
Variable X_5 = Chronological Age			
Zero-order Correlations (product-moment) $N = 159$			
$r_{12} = .64$			
$r_{13} = .51$	$r_{23} = .56$	$r_{34} = .31$	$r_{45} = -.50$
$r_{14} = .49$	$r_{24} = .69$	$r_{35} = .01$	
$r_{15} = -.28$	$r_{25} = -.29$		
Partial r 's			
$r_{12.3} = .49$	$r_{12.34} = .33$	$r_{12.345} = .33$	
$\sigma_{12.3} = 4.63$	$\sigma_{12.34} = 4.58$	$\sigma_{12.345} = 4.55$	
β coefficients			
$\beta_2 = .417$		$\beta_4 = .056$	
$\beta_3 = .260$		$\beta_5 = -.133$	
Multiple Regression Equation (score form)			
$X_1 = .366X_2 + .470X_3 + .027X_4 - 124X_5 + 15.59$			
Multiple R in terms of β Coefficients			
$R^2_{1.2345} = .267 + .133 + .027 + .037 = .464$			
$R_{1.2345} = .681 \quad \sigma_{1.2345} = 4.55$			
$R_{1.2345} = .671$ (corrected for shrinkage)			

Discussion

The results indicate that a significant relationship exists between reading comprehension (together with word meaning) and arithmetic reasoning as measured by the Stanford Achievement Test.

At first glance, one might suppose that this relationship might be accounted for by such obvious variables as intelligence, chronological age, and not quite so obviously, arithmetic computation. Yet even when these variables are partialled out, the original product-moment r drops only from .64 to .33, which is still significantly different from zero. Furthermore, the multiple regression equation for arithmetic reasoning indicates that variance in average reading scores makes a substantially greater contribution to variance (27%) in arithmetic reasoning than does any of the other variables. However, it must be noted that even when we summate the individual contributions of variance in computation, reading, intelligence and age we can only account for approximately 46% of the variance of arithmetic reasoning, leaving 54% which must be accounted for by other factors. This suggests that any attempt to predict achievement in arithmetic reasoning from the other variables would be a somewhat perilous undertaking at the grade II level.

One of the implications of these findings is that if a causal relationship does exist between reading achievement and arithmetic reasoning, this factor must be taken into account in our teaching at the primary grade levels. It appears to be a matter of simple deduction that if, even at the grade II level, poor reading comprehension (among other things) will be reflected in low arithmetic achievement, the long term effects will be still more serious. Indeed, much of the literature on this subject is concerned with the effects of poor reading comprehension on arithmetic problem-solving at the high school and college level.

Summary and Conclusions

A partial and multiple correlational analysis of the Average Reading, Arithmetic Reasoning and Arithmetic Computation Grade Scores of 159 Grade II rural pupils in the Stanford Achievement Test (Primary Battery) suggested that:

1. There is a significant relationship between Average Reading scores and Arithmetic Reasoning scores even when age and intelligence are partialled out.
2. Variance in Average Reading scores contributes substantially to variance in Arithmetic Reasoning.
3. In the reading comprehension aspects of primary education, attention should be given to teaching for transfer to the problem-solving aspects of arithmetic skills.

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EDUCATIONAL RESEARCH IN AUSTRALIA*

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Australia is a young, vast, sparsely-populated country. The first European settlement in Australia did not take place until after the American Revolution, while the Commonwealth of Australia was not formed until 1901. Australia is about the size of the United States, but has a population of approximately only nine million. Yet in spite of youth and meagre population, Australia's organization and accomplishment in educational research should be of interest to Canadians.

There are four main types of agencies at present carrying on educational research in Australia: the Australian Council for Educational Research, the State departments of education, the Commonwealth Office of Education, and the universities.. This article will be concerned mainly with the organization and activities of the first of these agencies; a future article may concern itself more fully with the others.

The Australian Council for Educational Research

The A.C.E.R. as it is usually called, is an autonomous body. It makes its own policy and decides its own program, entirely independently of control by any governmental agency, university, or other body. A.C.E.R. was founded in 1930 as the result of an endowment from the Carnegie Corporation of New York. Following a visit to Australia in 1928 of Dean Emeritus James E. Russell of Teachers College, Columbia University, a committee consisting of Mr. Frank Tate, Professor H. Tasman Lovell, and Professor A. Mackie, after consultation with delegates from each of the State Institutes for Educational Research which had been set up, formulated a proposal which was acceptable to the Carnegie Corporation. Dr. K. S. Cunningham was appointed as Executive Officer. Since the termination of the Carnegie endowment in 1943, the Council has been financially supported from Australian sources.

The Council consists of one representative of each of the State Institutes for Educational Research, and three other members co-opted by the Council. A State Institute for Educational Research is defined as a body of individuals in each State interested in educa-

*The writer is indebted to D. W. C. Radford, Director, Australian Council for Educational Research, for providing some of the materials upon which this article is based, and particularly for permission to use parts of the manuscript of an article, by J. J. Pratt and W. C. Radford, to appear in the first issue of the new **Australia Journal of Education**.

tional enquiry, and recognized by the Council for purposes of nominating a member to the Council. Though the Council co-operates with the State Institutes, the Institutes are free to determine their own constitutions and their own programs.

In 1955 the active staff of the Council, with its headquarters in Melbourne, numbered ten professional persons, and fourteen secretarial, clerical, and sales staff.

In its first year of operation the expenditure of the Council amounted approximately to £5,000. In 1956 its expenditures totaled over £51,000, and it had by that year accumulated funds amounting to almost £75,000. In 1955-56 the principal sources of income of the Council were grants from the Commonwealth Government and from each of the State Governments (totalling £10,000), sales of tests and publications, income from accumulated funds, and contributions from teachers' bodies, industry and commerce.

The Council's major activities can be classified as: (1) the conducting and sponsoring of research into educational problems at all levels, (b) the provision of library, information, and consulting services to students and research workers in education and related fields, (c) the preparation and distribution of educational and psychological tests, and (d) the publication of reports and accounts of research and other studies in education.

Between the years 1930 and 1955 the Council's staff, in addition to conducting many minor studies, carried through ninety-three major research studies and investigations each of which resulted in the preparation of a report or test of wide distribution, or which was required by an outside agency for a particular purpose. Many of these studies have been concerned with the preparation and standardization of Australian tests of intelligence and Australian tests in the basic school subjects, together with statistical studies of these tests. In addition, however, a good many titles such as the following appear in the list of A.C.E.R. researches: study of Australian correspondence education, sponsorship of the Carnegie Corporation survey of Australian libraries, investigation into educational aspects of youth-adult employment, survey of adjustment of youth by four investigators sent to Europe and the United States, studies of the spoken vocabulary of pre-school children and of the written vocabulary of ten-year old children, and survey of the relative extent and difficulty of curricula and examinations in each State for children of 11 plus and 14 plus years. During the war years much of the Council's research work was done for or in conjunction with the Armed Services and various Government Departments.

A comprehensive review of Australian research studies during the period 1950 to 1956, with complete bibliographical references, has been provided by W. C. Radford in the American Educational Research Association's *Review of Educational Research*, XXVII, 1, (February, 1957). Readers interested in specific Australian investigations, including A.C.E.R. studies, should consult that article. Brief reference might be made here, however, to one important recent A.C.E.R. study on a topic which is of considerable current interest in Canada.

Toward the end of 1955 Dr. H. H. Hohne completed an intensive investigation into the university careers of the students who entered the University of Melbourne in 1943 and 1944. The study was designed to determine whether a battery of psychological tests given to students and evaluated together with matriculation examination results would significantly increase the prediction of academic success over prediction based on matriculation results alone. Valuable data on rates of wastage in the University also emerged from the study.

A battery of psychological tests administered to all students entering the University of Melbourne in 1943 consisted of: ACER Adult Test B40 (Intelligence); ACER Speed and Accuracy Test; ACER Mechanical Comprehension Test; ACER Number Test; Revised Minnesota Paper Form-Board Test; Verbal Test; Group Rorschach (screen version); Woodworth-Martin Personal Inventory. A slightly modified battery was administered to students entering in 1944. In each year an Entrance Score was calculated, based on the student's results in the matriculation examination.

Amongst the principal findings of the Hohne study were these: (1) Psychometric tests do not add appreciably to the predictive power of the matriculation examination, but, above the minimum levels, do help to identify students with steeply rising chances of success. They could not be used with confidence to reject more than a small number of intending students who passed the matriculation examination. (2) Prediction from the present types of entrance examination, or from psychometric tests, is always uncertain when factors which affect success within the university, such as teaching and examination practices, cannot be controlled. (3) Of the full-time students entering the Faculty of Arts in 1943, 68 percent had graduated by April, 1951; of the 1944 entrants 65 percent had graduated. When full-time and part-time students of the Arts Faculty were considered together, the wastage rate was under 50 percent. (4) Of the full-time students entering Scientific Faculties in 1943 and 1944, 71 percent had graduated by 1954. When full-

time and part-time students of the Scientific Faculties were considered together, the wastage rate was slightly under 40 percent.

The foregoing paragraphs have given some indication of the types of research conducted by the staff of A.C.E.R. Grants approved toward investigations carried on by other than Council staff during the period 1930 to 1955 totaled 220, representing a total expenditure of £20,000. In recent years there has been a marked decline in requests for aid by individual investigators, largely because of increased facilities for research elsewhere. This decrease has been accompanied by a corresponding increase in staff research, and in services offered by Council staff.

Providing information, consultant, and training services has always been an important function of the Council. The Council's library makes about 2,400 loans a year to borrowers in all States. New books are brought to the attention of educationists and librarians. Requests for information are received on many aspects of education in Australia and in other countries. Members of the Council's staff have supplied most of the articles on Australia which have appeared over the years in the *English Yearbook of Education*, while the Director represented Australia at the first international conference on educational research held in United States in 1956. Between 1930 and 1955, 21 teachers from all States have been nominated by State education departments for training at Council headquarters, with their salaries paid by the Council during the term of seconded duty with the Council. This scheme has resulted in the establishment of a core of trained educational research workers distributed throughout the country.

Quite early in its history the Council began to devise objective tests of ability and attainment and to adapt tests from other countries. A number of Australian-wide standardizations have been conducted, with national norms being made available. A special Test Division was established in 1947 to handle construction and distribution of tests; it now distributes about 2 million test copies a year. Of the 115 different tests which have been published by the Council between 1930 and 1955, 52 tests were constructed by the Council staff, 14 were constructed by other Australian authors, and 49 were tests first published overseas and then adapted for use in Australia. The Australian teacher or psychologist probably has a wider range of testing material, constructed or adapted specifically for use in his own country, available to him than has his counterpart in any other country except the United States.

Its constitution also lists as one of the Council's objectives the publication of the results of research and other investigations approved by the Council. By 1955 the Council had made 122 such

publications, 66 of which were items in its *Educational Research Series*. The *Review of Education in Australia* has appeared four times, while the publication of a new journal, the *Australian Journal of Education*, has recently been sponsored by the Council.

The A.C.E.T. is continuing its policy of research into testing procedures and their refinement, and has recently concentrated upon the development of objective tests for the tertiary level. An extensive survey of courses of study and attainment in English and Arithmetic, Hohne's intensive study of success and failure in university, and Keat's work on test scores, their distribution, and appropriate statistics related to them, are examples of recent studies which have influenced educational policy in various quarters. The particular interests of A.C.E.R. at present are to complete an enquiry into age of admission to primary schools and promotion policies in Australia, to get under way a comprehensive enquiry into inspection in primary schools, and to plan a program of research into secondary education which will be genuinely collaborative.

The Australian Council for Educational Research provides an outstanding example of a national but independent educational research organization which is playing a vital role in the educational development of a young country. Perhaps the most significant feature of recent years in A.C.E.R. activities has been the increasing amount of collaborative work which has been done between A.C.E.R. the State departments, and the universities.

State Departments of Education

Each of the six State departments of education has a research branch and at least one research officer, although organization and roles differ from State to State. The first department of education specialist in research and psychology was appointed in 1922. Appointment of full-time research officers in the other States followed in 1935, 1938, and in the 1940's. In New South Wales, under the Principal Research and Guidance Officer, there is a Chief Research Officer with four senior research officers, five research officers, and the departmental librarian; the organizational plan for the division provides for the senior research officers to specialize in curriculum, general research, visual education, and publications.

In addition to the work involved in providing information required by the administration for its day-to-day decisions, other research problems of a more long-term nature are dealt with by the State research branches. All research offices have been used extensively to predict school populations and building and teacher needs.

In Queensland and New South Wales, especially, there is an increasing tendency to use the research office to appraise the effects of administrative policies. In Queensland, for example, there is at present being conducted, under fairly strict control, an experiment appraisal of a far-reaching change in primary school methods of teaching reading in that State. Other such evaluative studies in Queensland have included investigations into long-term comparative standards in the basic subjects, the effectiveness of selection procedures, and the improvement of guidance instruments. It is worthy of special note that this State department of education has frankly made the results of its research work readily available for all to read in a series of bulletins, and also in the *Queensland Gazette*. Too often little of the research work done by a state (or provincial) department of education becomes known outside the walls of the department. This forthright publication of its evaluative studies by the Queensland research office represents perhaps the most significant recent development in Australian State department research.

Examples of the many studies reported as under way in 1956 in other State departments include: in New South Wales — an examination of the social attitudes of pupils in co-educational schools compared with those of pupils in single-sex schools; comparative studies of pupils in comprehensive and specialist schools in New South Wales; and a comparison of the performance of secondary pupils by class teachers with that of pupils taught by subject teachers. In Victoria — a study of acceleration and retardation in state primary schools in relation to age of entry; a method of teaching spelling based on individual written assignments; and special equipment and teaching aids for handicapped children. In Western Australia — the prediction of success in pharmacy examinations; the development of writing scales; and an historical account of the forces that have moulded the educational institutions of Western Australia.

The Commonwealth Office of Education

When the Commonwealth Office of Education was established in 1945 it set up a Research Section. Through its bulletin surveying particular aspects of education, its annual reports to the International Bureau of Education and UNESCO, its predictions of enrolments, its studies of language teaching to immigrants, its preparation of readers for native children, its research work on the hard of hearing, and its studies of the university progress of Commonwealth Scholarship winners, it has made a great deal of background information available on Australian education. Examples of studies reported in 1956 by the Commonwealth Office included:

construction of tests in English for Asian students, future educational needs of the Northern Territory, a survey of research into causes of failure in schools, and a survey of education in Indonesia.

The Universities

Since World War II there has been a decided increase in Australia in the quantity and quality of educational research done under the auspices of university departments of education and psychology, both of staff and by postgraduate students. There has been a considerable increase in the actual numbers of students proceeding to post-graduate degrees, with an accompanying growth in numbers of staff, while in two or three universities educational research fellows have been added to staff. The Ph.D. is now available in Australia for students in education, and the M.Ed. is available at several of the universities. Psychology and history departments are also contributing research on or related to education, while the teachers' colleges also are doing some research.

Some Negatives

The Canadian observer would surely be justified in concluding that for a young and isolated country Australia has gone a commendable distance in its organization of, and accomplishments in, educational research. He might profitably consider some implications of Australian experience for our own work in this field. Lest the impression be left that the Australians are smugly complacent about their achievements, and at the same time to indicate some directions in which future developments in that country can move, a few observations concerning Australian research may be quoted directly from the previously-mentioned article by Dr. Radford in the last *Review of Educational Research*. In various places he comments:

Relatively little work is published in book form; there is no journal devoted specifically to research; what appears in print is restricted in quantity and is often presented in too condensed a form for proper appraisal. There is no central repository for abstracts nor any micro-filming service for distribution overseas of unpublished research studies; Australia has few trained research workers engaged in research since many of those with the necessary training move into administrative work in which time and opportunity for research are limited. University staffs have varied in productivity, and most of their time is spent in supervising and guiding students. There is an absence of studies of the administrative process; little work of a sociological nature. Little has yet been attempted in integrating completed research work; it is still true that Australian research is not strongly influencing Australian practice; the majority of the work done is survey, and the use of the more recently devised technics of research is rare.

Australia's achievements and limitations in education research will both have lessons for Canadian readers.

AN ANALYSIS OF THE SELF-CONCEPT OF GRADE NINE STUDENTS

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The concept of self has of late been engaging the renewed attention of a number of psychologists. The *self-concept* may be defined as a system of feelings, attitudes, and values which the individual has accepted as definitions of himself. In this study the self-concept is a composite self-image obtained from a list of self-referent statements selected from self-descriptive essays written by adolescents.

Though there have been a number of studies reported in current psychological literature dealing with self, most of the research has dealt with the self-concept of college students and little has been reported on adolescents in junior high school. In discussing the self-concept Wattenberg¹ says: "In a field which is in its infancy, the amount that deals specifically with the teen years is slight. Most of the available material on the subject has grown out of clinical observations."

Since the school is one of the determiners of a young person's personality in the development of desirable traits, values, and attitudes, it might well concern itself with the person's concept of himself. It might attempt to reduce as far as possible the carry-over of unhealthy attitudes toward self that young people bring with them into adult life. Jersild² sees the need for doing something in the educational program to help children and youth to develop realistic attitudes of self-acceptance. In a more recent publication Jersild points out that "When an adolescent has an unrealistically low estimate of himself he fences himself in and does not exert maximum effort."³ On this assumption, educationists should examine the implications of accepting the self-concept as a basic concept in education. By helping the young person to gain an insight of himself, we can help him gain a better understanding of himself and assist in improving his adjustment.

The self-concept is believed by many to be one of the most important variables in learning. It is well known that attitudes affect learning. Speaking of attitudes Hobbs⁴ states:

But if one samples broadly enough of such attitudes, one is dealing with the self, it would seem, as a potent factor in learning. Why do girls consistently do better in some subjects than boys? Why can a delinquent lad learn so much about guns and so little about Geometry? Why do some

¹William W. Wattenberg, *The Adolescent Years*, p. 326.

²Arthur T. Jersild, *In Search of Self*, p. 5.

people learn to be good citizens so much more readily than others? There are doubtless many factors involved, but perhaps the individual's concept of himself is one of the most important variables.

An examination of the self enables an individual to gain feelings of self-acceptance, to arrive at a realistic picture of himself, and to better realize his potentialities in relation to his world.

A number of studies, such as those conducted by Rogers⁵ and Bills⁶, have demonstrated the importance of the self-concept in personality adjustment.

The Problem and Research Design

The purpose of this study was to measure the self-concept of grade nine students. Secondary aims included the investigation of relationships between areas of the perceived self, relationships between self-concept and intelligence, and evidences of sex differences.

From self-descriptive essays on the topics, "What I Like About Myself," and "What I Dislike About Myself," 246 self-referent statements were selected and classified into four broad areas of self-perception: mental, personal, social, and physical. These 246 statements, under the assessment of five judges, were reduced to 77 statements, these constituting the research instrument. A scoring system was developed by having the 77 statements read by a criterion group of fifty-three grade nine students to determine the desirability or undesirability of feelings or values expressed by each statement. The statements may thus be designated as approved or unapproved.

The instrument, referred to as *self-concept rating schedule*, was administered to over 400 grade nine students. The subjects rated themselves on each item of the schedule as follows:

T	true of me—a good description of me
MT	mostly true of me—but not completely true
NA	neither true nor false of me—not applicable to me
MF	mostly false of me—like me only to a small extent
F	false of me—not like me at all.

About one week before the administration of the schedule the subjects were given the Otis Self-Administering Test of Mental Ability, Intermediate Form A.

The subjects were grade nine students from four Edmonton junior high schools. Usable data were obtained from 384 subjects, 190 male and 194 female. The range of I.Q.'s was 64 to 131, with

³Arthur T. Jersild, *The Psychology of Adolescence*, p. 105.

⁴Nicholas Hobbs, "Guidance and Some Recent Developments in Psychological Theory," *Canadian Journal of Psychology*, (June, 1949), p. 68.

⁵Carl V. Rogers, *Client-Centered Therapy*.

⁶Robert E. Bills, "Progress of Research with the Index of Adjustment and Values," Unpublished Manuscript, University of Kentucky, 1953, (Mimeographed).

a mean of 110.7 and standard deviation of 10.5. The mean for boys was 108.6 and for girls 112.5. Mean ages for boys and girls were 14 years 11 months and 14 years 7 months respectively. The age range was 12 years 8 months to 18 years.

ANALYSIS OF DATA

Areas of Perceived Self

Each statement in the schedule was allocated to one of four areas of self-perception: mental (four items), personal (thirty-two items), social (twenty-six items), and physical (fifteen items). The scores for each area, as well as total scores on the instrument, were held to represent measures of self-acceptance in terms of the group ideal. The group ideal consists in the evaluation of the desirability or undesirability of feelings or values expressed by each statement as rated by the criterion group of 53 students.

The instrument was readministered to two classes of students in one school eight days after the first administration. The test-retest product-moment coefficient of correlation calculated for fifty-seven subjects was .91 with a standard error of .01. The correlation coefficient differs from zero at less than the .001 level of confidence. Therefore, the data show that acceptance of self scores are reliable measures, or in other words, what is being measured is measured consistently.

Product-moment correlation coefficients between the areas of the perceived self are shown in Table I. The largest correlation coefficient of .77 indicates that the highest relationship was between the areas of the personal self and the social self. The lowest relationship was between the areas of the physical self and the mental self. All inter-correlations were found positive, and all significant at less than the .001 level of confidence.

TABLE I
INTERCORRELATIONS BETWEEN THE AREAS OF
SELF-ACCEPTANCE

AREA	MENTAL	PERSONAL	SOCIAL
PHYSICAL	.31 ± .11	.55 ± .10	.60 ± .09
SOCIAL	.40 ± .11	.77 ± .06	
PERSONAL	.52 ± .10		

Sex Differences

The mean area or sub-test scores were higher for female subjects in the personal, social and physical area, and only slightly lower in the area of the mental self. A summary of the differences is given in Table II. No significant sex differences between the means were found in the areas of the mental self and personal self. The differences between the means in the social area were found to be significant at the .01 level of confidence, in favor of girls.

TABLE II
AREA OF SELF-ACCEPTANCE MEAN SCORES, STANDARD DEVIATIONS, STANDARD ERRORS, DIFFERENCES BETWEEN MEANS, AND SIGNIFICANCE OF DIFFERENCES BY SEX

AREA	GROUP	MEAN	S	S _M	D _M	S _D	D _M /S _D	SIG.
MENTAL	Female	6.1	7.6	.566	-0.9	.782	-1.15	
	Male	7.0	7.7	.561				
	Total	6.6	7.6	.388				
PERSONAL	Female	77.9	36.2	2.60	0.6	3.68	.116	
	Male	77.3	36.0	2.61				
	Total	77.6	36.2	1.84				
SOCIAL	Female	100.6	33.0	2.37	8.1	3.45	2.35	.01
	Male	92.5	34.5	2.50				
	Total	96.6	33.8	1.72				
PHYSICAL	Female	38.0	25.6	1.84	8.9	2.69	3.31	.001
	Male	29.1	27.0	1.96				
	Total	33.6	26.7	1.36				
TOTAL SCORES	Female	222.4	87.3	6.27	17.4	9.07	1.92	.03
	Male	205.0	90.3	6.56				
	Total	213.7	89.4	4.56				

NOTE: S standard deviation
S_M standard error of mean
D_M difference between means
S_D standard error of the difference between means
D_M/S_D critical ratio
Sig. significance of difference between means

In the area of the physical self the difference, also in favor of girls, was significant at the .001 level of confidence. For the total scores the differences between the means was significant at the .03 level of confidence, again in favor of female subjects. It can be said with

a certain amount of assurance that sex differences in self-acceptance scores are significant. In addition, these differences show that girls are generally more accepting of self than boys are, particularly in the areas of the social self and the physical self.

To obtain additional evidence of sex differences, responses to individual items were analysed. Percentages of responses to items were calculated, and differences between combined "*true*" and combined "*false*" responses were examined. These differences were independent of group valuation and give measure of differences in self-concept rather than measures of acceptance of self. For a number of statements in the areas of the personal, social, and physical aspects of self the differences were significant at less than the .003 level of confidence. No significant sex differences were found in the area of the mental self, possibly because of the small number of items included.

A significantly larger percentage of girls than boys felt that the following statements described them well:

- Religion plays an important part in my life. (M37, F66)
- My feelings are easily hurt. (M36, F50)
- I am a hard worker. (M65, F77)
- I am easily embarrassed. (M39, F53)
- People can depend on me. (M86, F95)
- I have patience with others. (M68, F91)
- My teachers like me. (M53, F76)
- I am helpful to others. (M79, F90)
- I get along with members of the opposite sex. (M87, F94)
- I am respected by others. (M58, F75)
- I am courteous. (M87, F92)
- I wear my clothes well. (M77, F90)
- I am attractive to members of the opposite sex. (M42, F53)
- I am a good dancer. (M37, F73)
- I have good taste in clothes. (M75, F93)
- I have nice hands. (M41, F54)
- I am neat and tidy. (M72, F87)
- I am just the right height. (M65, F75)

Percentages of *true* responses for each sex (M for male and F for female) are given in parentheses following each statement. Of the above statements the majority express feelings or values pertaining to aspects of the social and physical self, with only three statements pertaining to aspects of personality and character.

A larger percentage of girls than boys said that these statements do *not* describe them well:

- I am better than others. (M65, F82)
- I make a bad impression on people. (M67, F81)
- Most people avoid me. (M63, F77)

Percentages of *false* responses by sexes are given in parentheses.

On the other hand more boys rated as *false* or *mostly false* the following statements:

- I am stubborn. (M59, F51)
- I am moody. (M68, F60)
- My feelings are easily hurt. (M60, F50)
- I am nervous (jumpy). (M73, F64)

Significant differences in favor of girls in the area of the social self may be interpreted as reflecting the higher degree of social integration that is quite common among girls of this age group as compared with boys. Differences in the physical area may be due to the differential rate of development between boys and girls. In addition, some of the statements, particularly in the physical area, might apply more to girls than to boys.

Self-Concept and Intelligence

Product-moment correlation coefficients which were calculated between raw scores on the Otis Test of Mental Ability and self-acceptance scores for the areas and for the total scores are given in Table III. No significant relationships were found. Though mental ability, as measured by the Otis Intelligence Test, appeared to have no relationship to self-acceptance, it is conceivable that an individual's concept of self may have some bearing on learning or achievement. This point was not investigated.

TABLE III

PRODUCT-MOMENT CORRELATION COEFFICIENTS BETWEEN RAW SCORES ON THE OTIS SELF-ADMINISTERING TEST OF MENTAL ABILITY, INTERMEDIATE A, AND AREA AND TOTAL SELF-ACCEPTANCE SCORES for 384 SUBJECTS

AREA	MENTAL	PERSONAL	SOCIAL	PHYSICAL	TOTAL
OTIS	.26 ± .12	.17 ± .12	.11 ± .13	— .06 ± .14	.09 ± .14
RAW SCORES					

The Self-Concept of the "Typical" Grade Nine Adolescent

Of the seventy-seven statements in the schedule, fifty-two were rated by the criterion group as expressing feelings or qualities that are desirable or approved. This group of statements reflects an approved concept of self when rated *true* or *mostly true*. To select the statements that were most representative of self-descriptions of adolescents, ratios of combined *true* to combined *false* percentage were calculated for each statement. These ratios were used to rank order the statements. Twelve of the most frequently preferred statements were selected as giving the self-concept of the theoretical "typical" adolescent. Percentages of *true* responses are given in parentheses by sex.

The top-ranking statements below give a composite self-picture of the grade nine adolescent:

- I am honest. (M94, F99)
- I get along with members of my own sex. (M97, F96)
- I am truthful. (M92, F96)
- I am kind. (M89, F95)
- I am loyal to my friends. (M94, F96)
- I am capable of looking after myself. (M96, F95)
- I like my parents. (M97, F95)
- I get along with others. (M97, F95)

The remaining four of the preferred statements for girls were:

- People can depend on me. (95)
- I get along with members of the opposite sex. (96)
- I am a good sport. (91)
- People who know me like me. (86)

For boys the remaining four of the twelve preferred statements were:

- I am a happy person. (95)
- I have many friends. (91)
- I am likeable. (79)
- I am considerate of others. (74)

The least preferred statements for both sexes were those which elicited high frequencies of *false* and *most false* responses. Percentages of *false* responses are given in parentheses following each of the statements:

- I am attractive to members of the opposite sex. (M19, F14)
- I am good at arguing. (M19, F20)
- Religion plays an important part in my life. (M44, F21)
- I settle down to work easily. (M26, F21)
- I am good-looking. (M15, F17)
- I make up my mind easily. (M26, F25)
- I am just the right weight. (M29, F26)
- I am attractive. (M13, F21)
- I have nice hands. (M27, F27)

Among the twelve less preferred statements for girls were also the following:

- I am good at sports. (20)
- I am intelligent. (23)
- I have good eyesight. (28)

Large percentages of boys rated these approved statements *false* or *mostly false*:

- My teachers like me. (16)
- I am just the right height. (27)
- I am a good dancer. (44)

The feelings or values expressed by approved high-ranking statements which were most preferred were mainly those pertaining to character, personality, and social relationships. Most of the approved low-ranking statements pertain to aspects of physical

appearance. Friendship, honesty, truthfulness, and ability to get along with others are not only valued highly in adolescents, but also appear typical of attributes which the adolescents said they possess. There appeared to be more concern with the physical aspect of self than with the other aspects.

Statements that were rated by the criterion group as expressing feelings of undesirable values reflect a negative self-concept if rated *true* or *mostly true*. The following six statements were those most seldom rated as true; or conversely most often rated false. In parenthesis appear the percentages of *false* rating for boys and girls.

Most people avoid me. (M76, F87)

I am better than others. (M65, F82)

I make a bad impression on people. (M69, F81)

I am a lonely person. (M84, F84)

I am clumsy. (M73, F79)

I am a disappointment to my parents. (M75, F76)

A number of unapproved statements elicited high percentages of combined *true* and *mostly true* responses. Many boys and girls felt that they can't stand criticism, that they think slowly, and that they worry about their health. About thirty-five per cent of the girls felt that they are stubborn, and that they daydream much. Forty per cent of the boys felt that they were restless, and that they envied others. Almost sixty per cent of the boys felt that there is nothing outstanding about them.

For a large number of statements high percentages of ratings were in the desirable direction. For a fewer number of statements marked percentages of ratings were in the undesirable direction. Most approved statements drew higher percentages of favorable responses than did unapproved statements. Some statements elicited high percentages of *not-applicable* responses. Unapproved statements generally drew more *not-applicable* ratings than did approved statements. This might be interpreted as indicating that the subject is on the defensive. On the other hand, it may be that the subject was unable to give the desired information, or that he did not understand the statement.

Summary

In evaluating the results of the study it is important to point out that conclusions reached may not apply outside the group studied, and that the self-concept analysis is limited to the seventy-seven statements of the research instrument. Furthermore, studies in perception of self are exploratory in a field that is in its infancy. Hence, there are limitations, such as, inconsistencies of present

theory, lack of external validating criteria, and the difficulty of treating subjectively-obtained data.

The study yielded clear-cut data and suggests that it is possible to construct helpful objective instruments that can be employed to obtain evidence to test hypotheses related to self-functions. The construction of a research instrument from self-referent statements selected from self-descriptive essays appears to be a feasible method, although there is no assurance that all the important aspects of selfhood can be obtained from student essays.

The high test-retest reliability shows that self-acceptance scores on the schedule are reliable measures. The range of these scores, and the standard deviation obtained, indicate that the schedule discriminates between individuals. High positive relationships were found between the four broad areas. The relationships between the areas of the social and personal aspects of self were highly significant.

Significant sex differences were found for mean self-acceptance scores in the social and physical areas, and for the means of total self-acceptance scores. Strong evidence was obtained that girls were more self-accepting than boys, particularly in the areas of the social self and the physical self. Analysis of responses to items produced further evidence of significant sex differences in all areas except the mental area. Most of the differences were in favor of girls. Further study of sex differences might prove both interesting and fruitful.

The presence of significant relationships between intelligence and self-acceptance was not supported by the data. An investigation of the relationships between self-concept and learning might be a rewarding follow-up to this study.

The most valued aspects of self were those relating to qualities of personality, character, and interpersonal relations, and it was those values that both boys' and girls' groups said they possessed. The subjects were less positive about the physical self. This might mean that there is more concern about physical aspects of self.

Disapproved statements appeared to have been rated differently from approved statements. They not only drew more unfavourably-directed responses, but they also elicited more non-committal responses. Is it possible that disapproved statements might be more discriminating than approved statements? A study of differences of response on this point might prove rewarding.

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FURTHER EVIDENCE ON THE CONTROL OF INDIVIDUAL DIFFERENCES IN THE CLASSROOM

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The Problem

Students of education must be receptive to the findings of research. They must, however, never lose sight of the fact that the truths of all science are, in degree, operational, tentative, and subject to constant revision in the light of new evidence. One of these truths, which has received continuous reinforcement over the past decades, relates to the nature and extent of individual differences in ability and achievement in the ordinary classroom. A related finding, which has less experimental support, maintains that these differences in ability and achievement are highly resistant to regulation and control. The schools have accepted the existence of individual differences but have shown their scepticism concerning the second finding by use of a number of devices aimed at securing greater homogeneity of ability and achievement in the classroom.

Recent large sample studies of intelligence and achievement in Alberta provided a body of data which permitted further exploration of these problems in the type of situation which occurs in the ordinary elementary and junior high school. The following hypotheses were to be tested:

- First: that individual differences in intelligence and achievement in a school of the usual size are comparable with those revealed in large sample studies.
- Second: that these differences are not subject to marked reduction through conventional or unconventional procedures designed to achieve a greater degree of homogeneity.

Related Studies

The evidence in support of the extent of individual differences is impressive. Wrightstone's¹ study of the achievement of New York children revealed spreads of five grades in the achievement in reading and spelling of grade three children, and spreads of as much as eight grades in junior high school. The Alberta studies²

¹J. W. Wrightstone, "Analysis of Intelligence and General Achievement, Third Grade Classes (New York City)," March-May 1949, Final Summary Report (typewritten copy). New York: Bureau of Reference, Research and Statistics, New York City.

²G. M. Dunlop, S. Hunka and H. Zingle, "Individual Difference in Alberta Schools." *Alberta Journal of Educational Research* (December, 1955), pp. 5-15.

revealed a spread of intelligence quotients of eighty I.Q. points in grade eight in a sample of 1044 pupils, and of eighty-three in a sample of 784 grade seven pupils. The range of grade scores in grade eight arithmetic was 6.7 grades. The spread of grade scores in grade seven was as follows: reading 6.3 grades, language 8.7 grades, and spelling 9.5 grades.

Evidence relating to the effects on spread of ability and achievement of various devices calculated to reduce heterogeneity are less numerous. Cook³ reports that when pupils are grouped in X, Y and Z fashion on the basis of an achievement test weighted heavily in the direction of reading and arithmetic there was a reduction of about twenty per cent in reading and arithmetic variability. This reduced the spread of achievement in grade six children from 8 years to 6.4 years with less impressive reduction in variability in other subjects. In a summary of existing evidence Otto⁴ reports that in grades organized into three ability groups variability in achievement is about 83 per cent as great as in unselected groups, and in classes organized into two ability groups variability in achievement is about 93 per cent as great as in unselected groups. He adds that these percentages are reduced to about 74 and 84 respectively if the plan of ability grouping is accompanied by a multiple track of promotion. The Alberta studies revealed an average range of intelligence of 52 I.Q. points in eleven ungrouped grade eight classrooms, as opposed to a range of 80 I.Q. points in the total sample, and an average range of arithmetic scores of 5.0 grades as opposed to the sample range of 6.7 grades. In a companion study at the grade seven level the average range of reading achievement in a single classroom was 5.0 grades as compared to 6.3 grades in the entire sample. In language the average spread of grade scores was 4.6 grades, instead of the 8.7 grades encountered in the sample. In spelling the spread was 6.0 grades as compared to the sample spread of 9.5 grades.

Two factors are involved in the reduction of the heterogeneity of ability and achievement. It is obvious that reduction of sample size to that of the enrollment of the ordinary classroom will normally reduce grade range in achievement. What is of immediate concern is the effect of various devices calculated to result in more homogeneous grouping on the variability of intelligence and achievement in the classroom.

³Walter W. Cook, "Grouping and Promotion in the Elementary School," *Series on the Individualization of Instruction*, Number 2, University of Minnesota, Minneapolis, 1941.

⁴Henry J. Otto, "Elementary Education." *Encyclopedia of Educational Research*, Revised Edition. pp. 367-382. Edited by Walter S. Monroe. New York: Macmillan Co., 1952.

The Plan

To reduce the problem to the level of every day practice in the ordinary classroom certain assumptions were made. In the usual junior high school a principal might expect to have four classes of thirty-five pupils each at each grade level. From the Alberta sample previously used in a survey of intelligence and achievement in the language arts at the grade seven level 140 pupils were randomly selected as the grade seven population of our hypothetical junior high school. Next the group was divided into four classes, successively, in terms of, first, intelligence, then achievement in reading, then in language, and finally spelling. In each case a study of the reduction in the spread of uncontrolled variables was made for the class of 35 pupils which ranked highest in the controlled variable. A similar study was made in the grade eight group where the variables in question were intelligence, Vocabulary and Fundamental Knowledge, Computational Skills, Problem Solving, and Total Arithmetic Score. Again the reduction in spread of scores of the uncontrolled variables was noted.

The Intelligence-Language Arts Results

The entire 140 grade seven pupils were randomly selected from the larger sample of 787 children. Table I reveals the expected wide range in intelligence and achievement of the group. The range of I.Q. scores, and achievement expressed as grade score is

TABLE I
MEAN, VARIABILITY AND RANGE OF INTELLIGENCE AND
ACHIEVEMENT OF 140 RANDOMLY SELECTED GRADE
SEVEN PUPILS

Factor	Range	Mean	Standard Deviation
I.Q.	71 (63-134)	105.93	12.967
Reading)	6.0 (5.0-11.0)	8.21	1.197
Spelling) Grade	6.7 (4.8-11.5)	8.71	1.389
Language) Score	5.9 (5.1-11.0)	9.20	1.1585

less than in the original large sample, which is attributable, in all probability, to the diminished number of pupils involved. Table II reveals sharply lowered ranges of grade scores in reading, language and spelling, when the group was made homogeneous with respect to intelligence to the extent that the brightest thirty-five children are included. The reduction in range of grade scores in reading was from 6.0 years to 3.4 years, a contraction in variability

TABLE II
MEAN, STANDARD DEVIATION AND RANGE OF GRADE
SCORES OF THIRTY-FIVE GRADE SEVEN PUPILS
SELECTED BECAUSE OF SUPERIOR
INTELLIGENCE

Factor	Range	Mean	Standard Deviation
I.Q. (C.)	18 (116-134)	123	4.526
Reading)	3.4 (7.6-11.0)	9.5	.8216
Spelling) Grade	3.3 (8.2-11.5)	9.6	.9247
Language) Scores	1.9 (9.1-11.0)	10.1	.5046

in excess of 43 per cent. The range of grade scores in spelling was reduced from 6.7 years to 3.3, approaching 50 per cent. The spread of scores in language was reduced from 5.9 grades to 1.9, a reduction of over 66 per cent. These reductions in range of grade scores in a class selected because of homogeneity in intelligence are so much greater than those previously reported that they warrant serious consideration. One factor must be recognized. The reduction in variability is partially accounted for by the reduction in sample size. Garrett suggests that the reduction of a sample from 200 subjects to 50 reduces range from 3.0 S.D. to 2.5 S.D. or .5 S.D. If we use this rough estimate on the reduction in range of reading scores we would have 1 S.D. or .82 grades accounted for of the total reduction of 2.7 grades leaving 1.88 grades of the reduction attributable to other causes, one of which would be the fact that the group was homogeneous in terms of intelligence. Applying the same procedure to the reduction in range in language and spelling, we find that 3.5 grades and 2.48 grades of the reduction in range of scores are not accounted for by the reduction in sample size, and may be the result of homogeneous grouping.

Table III presents an analysis of the spread of intelligence and achievement in language and spelling in a class composed of children who are superior in reading. It will be noted that the range in I.Q. is reduced from 71 I.Q. points in the larger sample to 33 I.Q. points, a reduction of almost 54 per cent. The reduction of range of scores in language and spelling is 67.8 and 50.7 per cent.

When the class was made somewhat homogeneous by using the thirty-five pupils with superiority in spelling, it was anticipated that there would be less reduction of range of scores due to lower correlation of spelling and academic achievement in other subjects. This expectation was realized in intelligence where the range rose

to 45 I.Q. points, a reduction of 36.6 per cent, and in reading where the reduction was approximately 28 per cent. However, the range of grade scores in language was sharply reduced by 4 grades, or 67.8 per cent.

The next step was the selection of a class of thirty-five pupils who demonstrated superiority in language. Table V gives the

TABLE III
MEAN, STANDARD DEVIATION AND RANGE OF GRADE
SCORES OF THIRTY-FIVE GRADE SEVEN PUPILS
SELECTED BECAUSE OF SUPERIORITY
IN READING

Factor	Range	Mean	Standard Deviation
I.Q.	33 (101-134)	119	8.9906
Reading)	1.9 (9.1-11.0)	9.8	.4793
Spelling) Grade	3.3 (8.2-11.5)	9.7	.9296
Language) Scores	1.9 (9.1-11.0)	10.0	.4962

TABLE IV
MEAN, STANDARD DEVIATION AND RANGE OF GRADE
SCORES OF THIRTY-FIVE GRADE SEVEN PUPILS
SELECTED IN TERMS OF SUPERIORITY OF SPELLING

Factor	Range	Mean	Standard Deviation
I.Q.	45 (89-134)	114	11.073
Reading)	4.3 (6.7-11.0)	8.9	.9723
Spelling) Grade	1.5 (10.0-11.5)	10.4	.4957
Language) Scores	1.8 (9.2-11.0)	10.2	.4586

TABLE V
MEAN, STANDARD DEVIATION AND RANGE OF INTEL-
LIGENCE AND GRADE SCORES FOR THIRTY-FIVE
GRADE SEVEN PUPILS SELECTED BECAUSE
OF SUPERIORITY IN LANGUAGE

Factor	Range	Mean	Standard Deviation
I.Q.	48 (86-134)	114	11.621
Reading)	3.6 (7.1-10.7)	9.0	.8825
Spelling) Grade	3.9 (7.6-11.5)	9.9	.97965
Language) Scores	.9 (10.1-11.0)	10.4	.800

variability of scores for intelligence, reading and spelling. It will be noted that the pattern of marked reduction of spread of intelligence and grade scores is again evident. The spread of intelligence scores is reduced from 71 to 48 I.Q. points or 32.4 per cent. The spread of grade scores in reading is reduced by 2.4 grades or 40 per cent. The range of grade scores in spelling has been reduced by 2.8 grades, or by 41.8 per cent.

The Intelligence-Arithmetic Study

Following the assumption utilized in the language arts study a group of 140 grade eight pupils were randomly drawn from the 1044 children used in the earlier survey of achievement in Arithmetic in Alberta. The usual statistics compiled for the entire group constitute Table VI. It will be noted that here we are concerned with intelligence and the three sub-scores for Vocabulary and Fundamental Knowledge, Computation and Problem Solving, and Total Score derived from administration of the Iowa Every-Pupil Test. Since all scores save intelligence relate to Arithmetic, we have an unusual opportunity to see how closely these skills are related. The first observation concerning the entire group suggests that the marked spread of individual differences recorded in similar studies is again present and in even greater degree than in the language arts study. As in the language study a class of thirty-five pupils was chosen in terms of superiority in intelligence, and the effect of this device, in securing greater homogeneity in the four arithmetic scores, was examined. The grade spread in Vocabulary and Fundamental Knowledge was reduced from 6.2 to 4.8, in Computation from 6.4 to 3.8, in Problem Solving from 6.4 to 3.5, and in Total Score from 6.5 to 3.4. These reductions are impressive.

TABLE VI
MEAN, STANDARD DEVIATION AND RANGE OF ACHIEVEMENT IN GRADE SCORES OF ONE HUNDRED AND FORTY GRADE VIII PUPILS

	I.Q.	Vocabulary & Fund. Knowledge	Computa- tional Skills	Problem Solving	Total Score
Range	79 (61-140)	6.2 (5.3-11.5)	6.4 (4.6-11.0)	6.4 (4.9-11.3)	6.5 (4.8-11.3)
Mean	105	8.5	8.7	8.8	8.7
S.D. (G)	11.625	1.365	1.434	1.323	1.428

When Vocabulary and Fundamental Knowledge was used as the criterion of selection the spread of I.Q. was reduced from 79 to 45 I.Q. points. The range of grade scores exhibited similar reductions: in Computation from 6.4 to 3.8 grades, in Problem Solving from 6.4 to 3.5 grades and in Total Score from 6.5 to 3.1 grades.

The pattern continued when Computation became the selective factor. Here, the range of I.Q. scores fell to 45 points, and grade scores for Vocabulary and Fundamental Knowledge to 4.8 grades, for Problem Solving 3.0 grades and for Total Score 3.4 grades. When Problem Solving was used in selection the range of I.Q. scores was reduced to 45, Vocabulary and Fundamental Knowledge to a spread of 4.0 grades, Computation to a range of 3.5 grades, and Total Score to a range of 2.9 grades. When Total Score was used as the criterion of selection, as might have been expected, it reduced the range of grade scores still more severely, Vocabulary and Fundamental Knowledge — 2.6 grades, Computation — 3.3 grades, Problem Solving — 2.7 grades.

Aside from the main problems the Arithmetic study suggests that a composite score on an arithmetic test, based on subtests measuring component abilities, is the best single agency of selection when seeking homogeneous grouping in the subject. This is not so remarkable as is the very considerable effectiveness of the component score in performing this function.

Discussion

We may now return to our two hypotheses. First, on the basis of this limited study, the existence of large individual differences is again confirmed. Note, however, that the very fact that we consider an ordinary classroom of thirty-five pupils as the unit under study diminishes the range and extent of individual differences in both intelligence and achievement from the extreme spreads encountered in the large sample studies. Ranges of 80 I.Q. points in large sample studies become ranges of 45 to 50 points. Spread of grade scores as measures of achievement drops from eight and nine grades to six grades in individual unselected classrooms. This is attributable to the recognized statistical fact that reduction in sample size results in a decrease in variability of scores. Since classrooms rarely exceed thirty-five pupils, this reduction in range in intelligence and achievement has already occurred, and the frightening ranges of ability and achievement of large sample studies become a little unrealistic. However, even the reduced range of grade and intelligence scores encountered in the ordinary classroom are formidable enough and must be reckoned with.

Our second hypotheses raised for consideration the generalization that selective devices for securing greater homogeneity of

pupils by use of criterion scores were of limited value as they rarely reduce variability by more than twenty per cent. In the Language Arts Study, grouping in terms of intelligence reduced variability by 43, 50 and 66 per cent in reading, spelling and language. When reading scores became the criterion of selection the reduction in range of grade score was 54, 67.8 and 50.7 per cent. When the poorest criterion, spelling, was used the reductions were 36.6, 28 and 67.8 per cent. When language was used for selection the reductions in spread of grade score were of the order of 32.4, 40 and 41.8 per cent. Surely these reductions in heterogeneity are larger than earlier studies suggest, and an indication of the promise which lies in further studies of prediction. The Arithmetic study confirms these findings. In particular, the Total Score criterion as the basis of selection reduced variability in Vocabulary and Fundamental Knowledge by 58.1 per cent, in Computation by 48.4 per cent and Problem Solving by 57.8 per cent.

This study illustrates the necessity for continued reflection on the relationship between accepted research findings and educational practice, even at this naive level. Its implications are listed for review:

1. Individual differences expressed in a spread of grade scores of five to eight years are found in large sample studies.
2. These differences are normally reduced in the ordinary classroom through the diminution in variability which attends reduction in size of a sample.
3. When classes are made homogeneous in terms of a single criterion score the reduction in variability in achievement within subjects seems more marked than earlier studies would indicate.
4. In view of this evidence there seems to be a need for further study of criteria of selection, and their efficiency in the reduction of individual differences in intelligence and achievement at the classroom level.

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